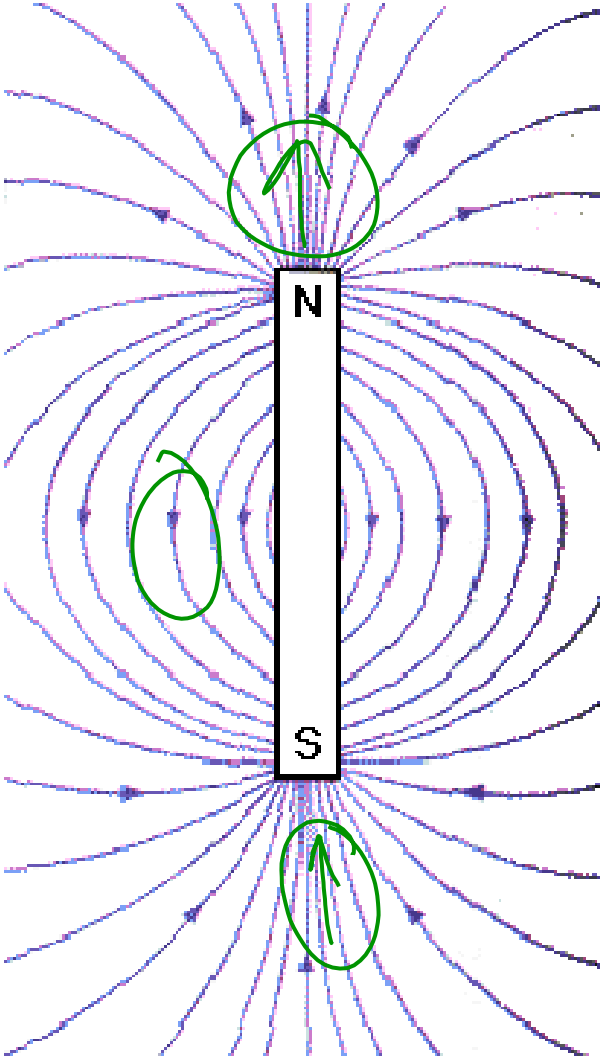
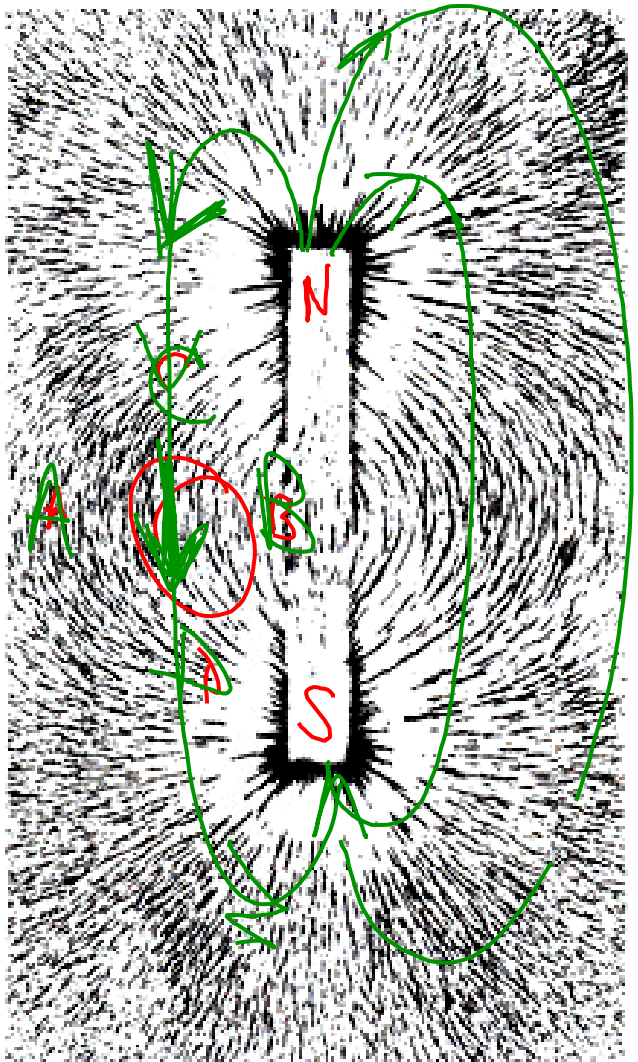
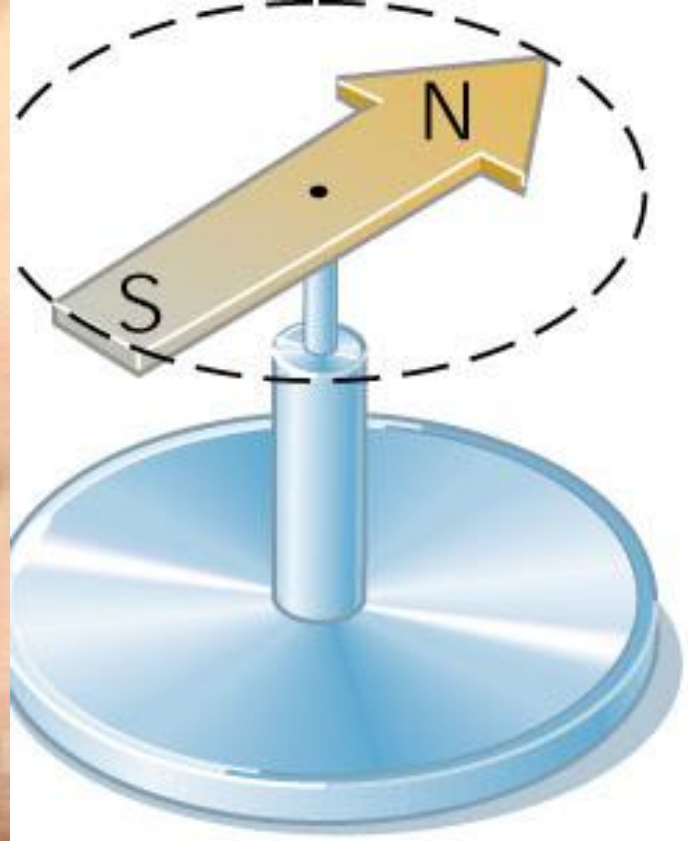
out of the NORTH pole of magnet + into the South

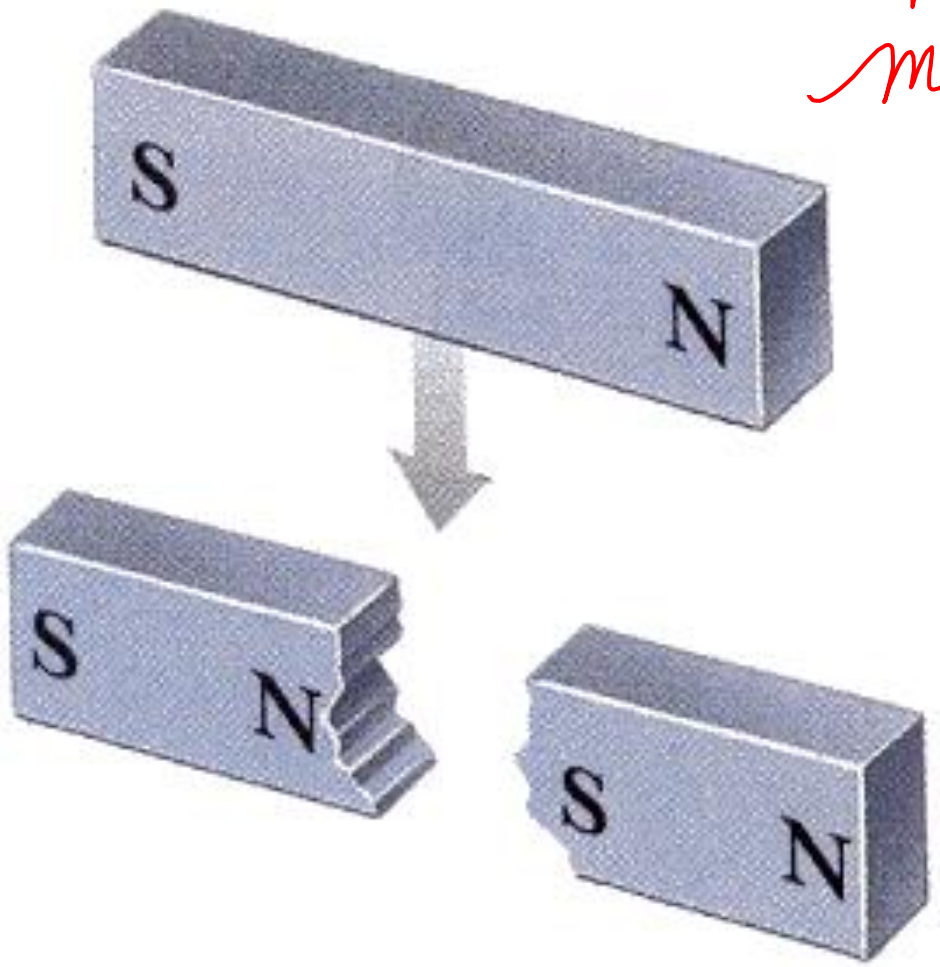


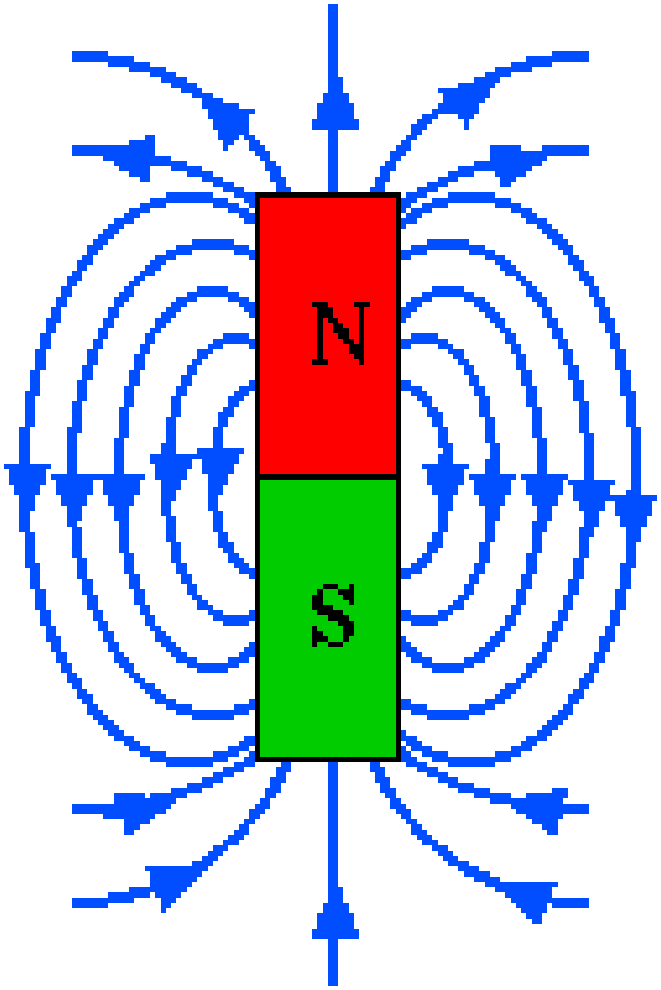




Cutnell & Johnson
Wiley Publishing
Physics 5th Ed.

Magnets have dipoles only. There is no magnetic monopole

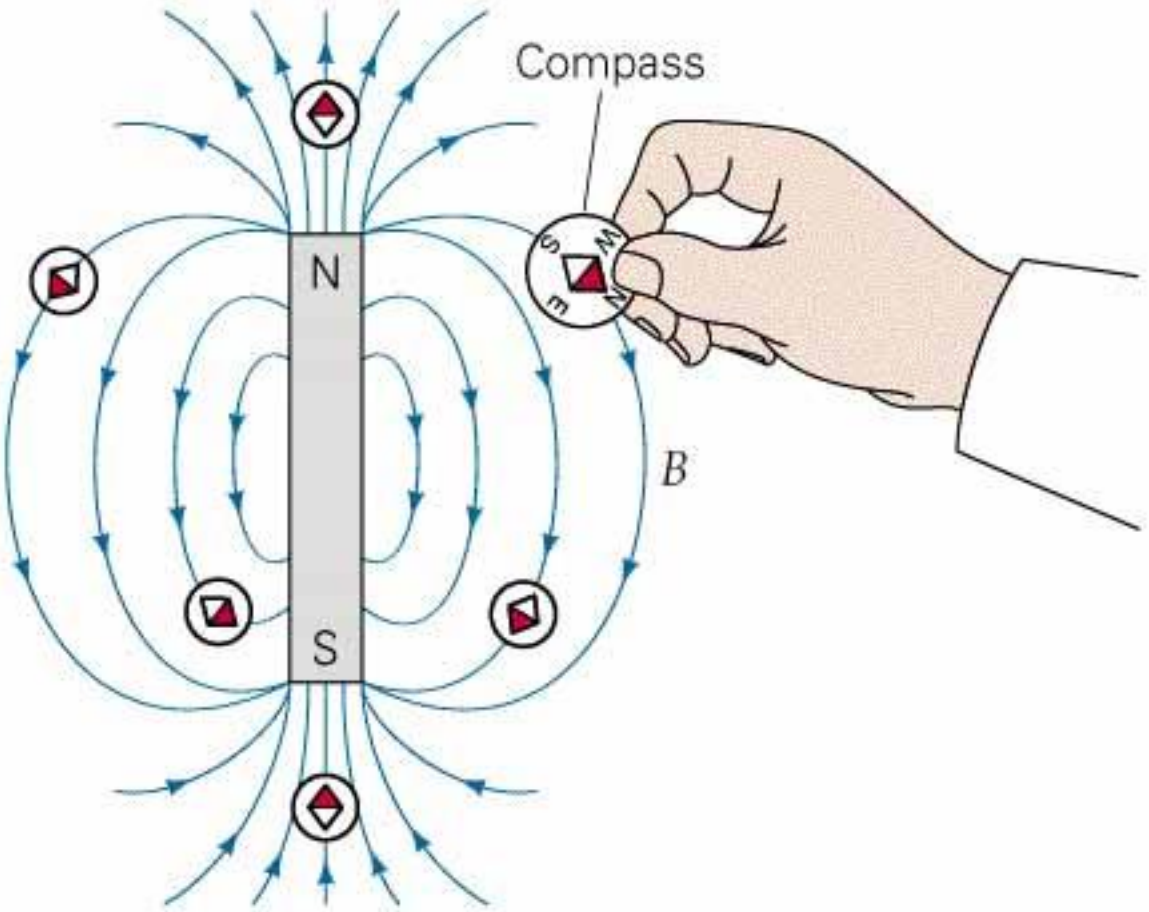




Magnetic Field Lines

a. point the way a compass points.

b. point out of the _____ and into the _____.



(a)

Magnetic Fields around permanent magnets

Imaginary lines of force around a magnet are called

Magnetic Flux lines

Magnetic Flux

Magnetic flux is given the symbol

ϕ "phi"

And is measured in

unit

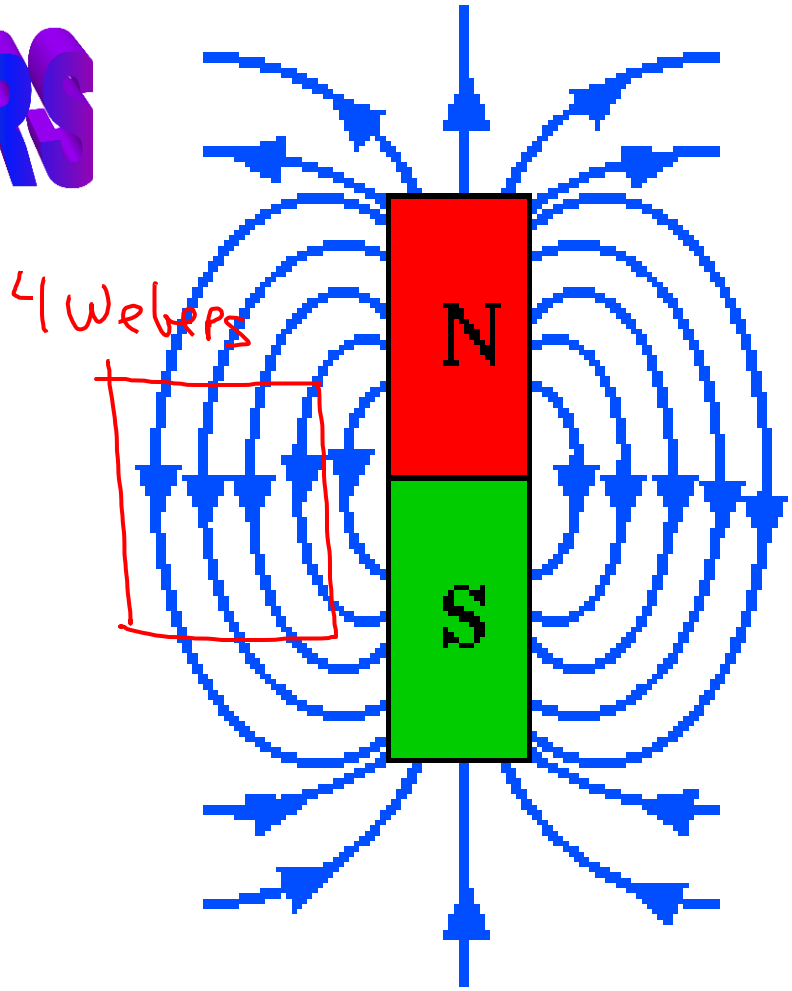
WEBERS

Magnetic Flux

Magnetic flux is given the symbol ϕ

And is measured in

WEBERS

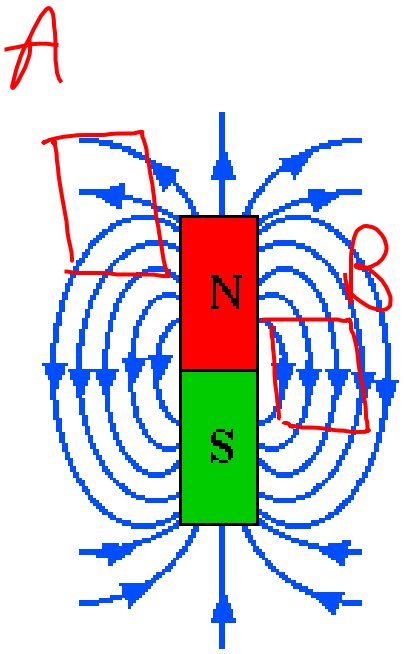


Each drawn field line represents 1 Weber of flux on a Regents exam.

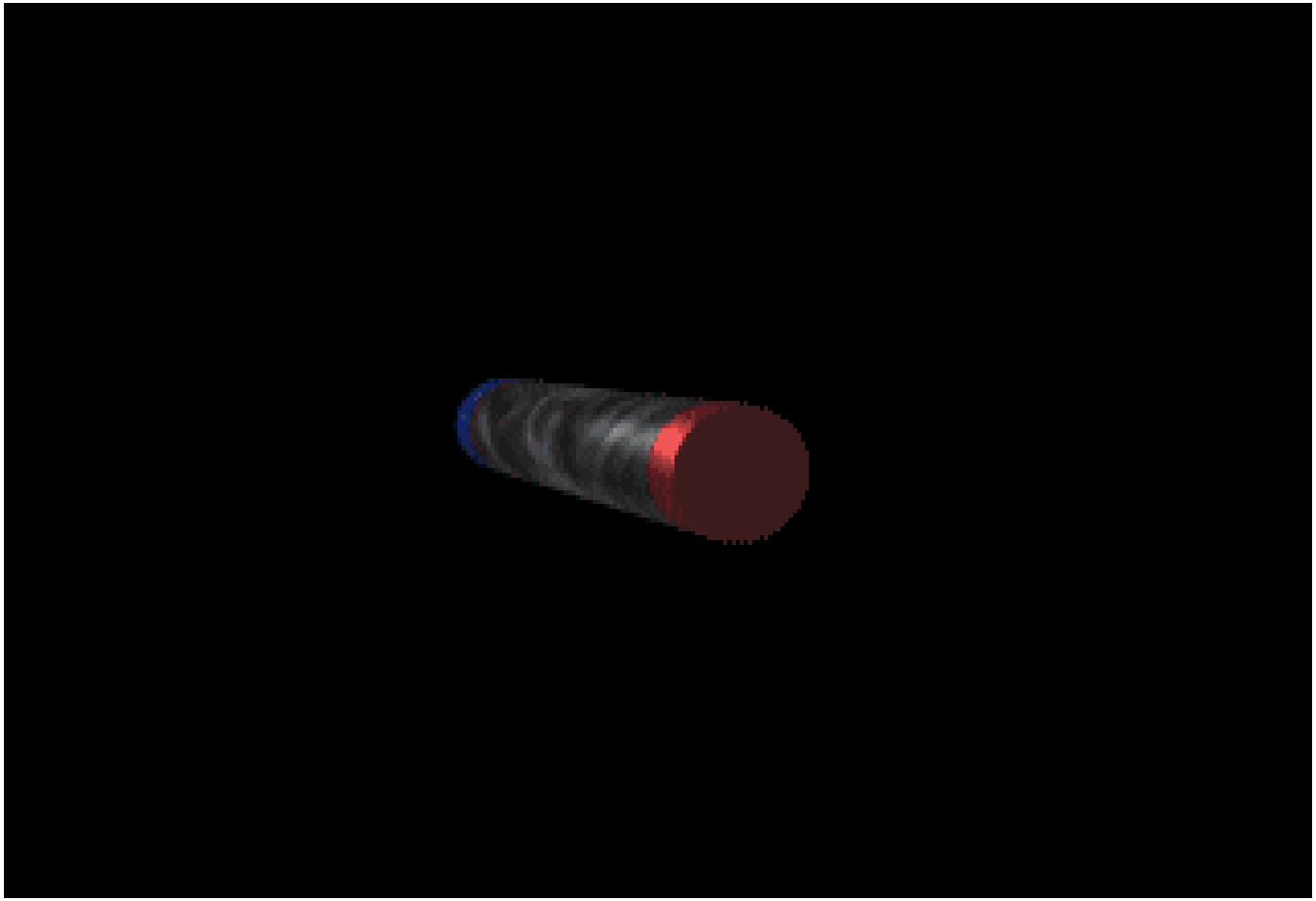
Magnetic Fields around permanent magnets

The magnetic flux density is the

Number of flux lines per unit area



$$\frac{\phi}{A} = \frac{\text{webers}}{m^2}$$



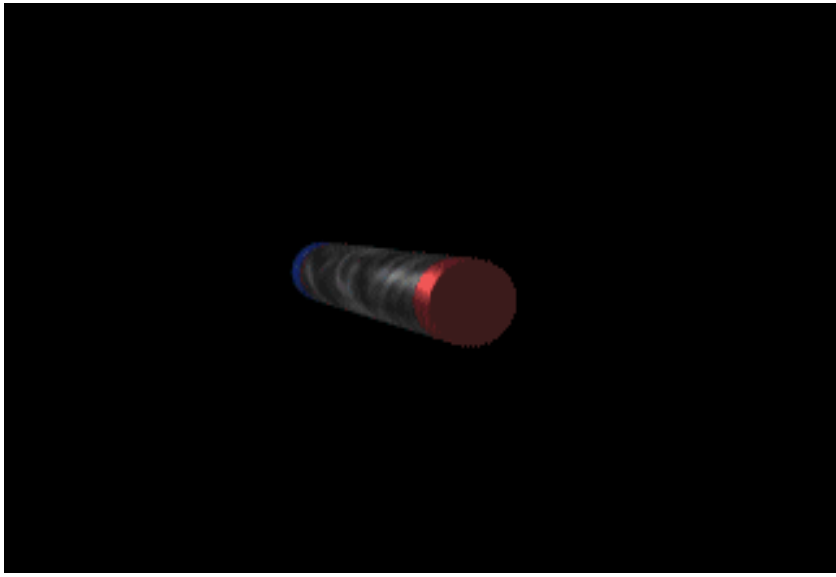
- The magnetic field is produced around the magnet. Picture the number of lines going through any given area: where that is greater, B is greater

Magnetic Flux

- These are the lines we draw to represent a magnetic field

You can see the flux lines grow, showing the magnetic field.

Magnetic fields are often called
B-fields



Magnetic poles

- Note that magnets always come in north, south pairs and never alone (monopoles). Even if we break the magnet in two, each half develops both north and south poles.

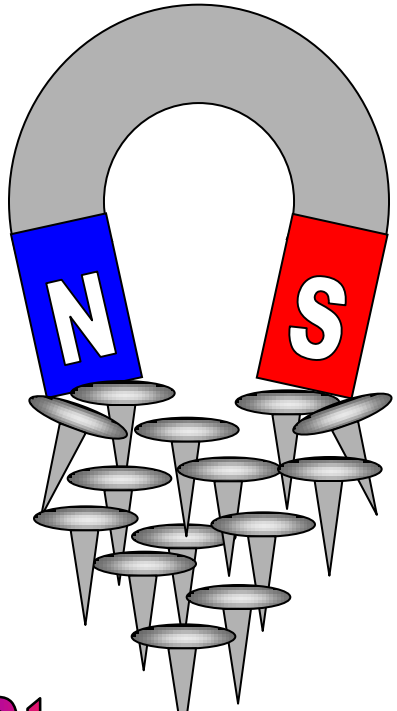
Flux Density and Field Strength

- The denser the flux lines, the stronger the field.
- The unit for measuring the amount of flux lines in an area is called the **weber, Wb**.
- Flux density is measured in webers per meter^2
- The **tesla,T**, is the SI unit for flux density
- 1 tesla=1weber/meter^2

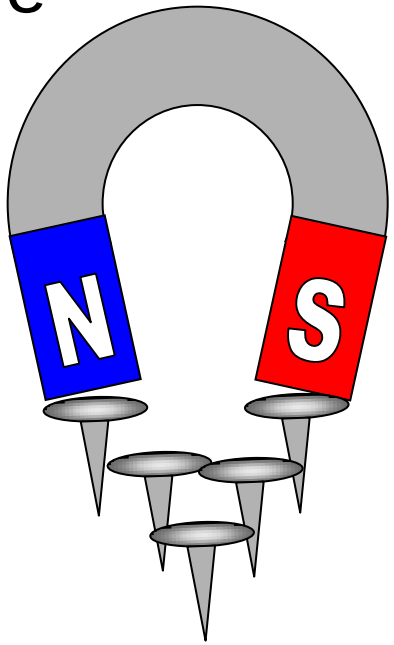
Magnetic Fields
around permanent magnets

Stronger magnets have more

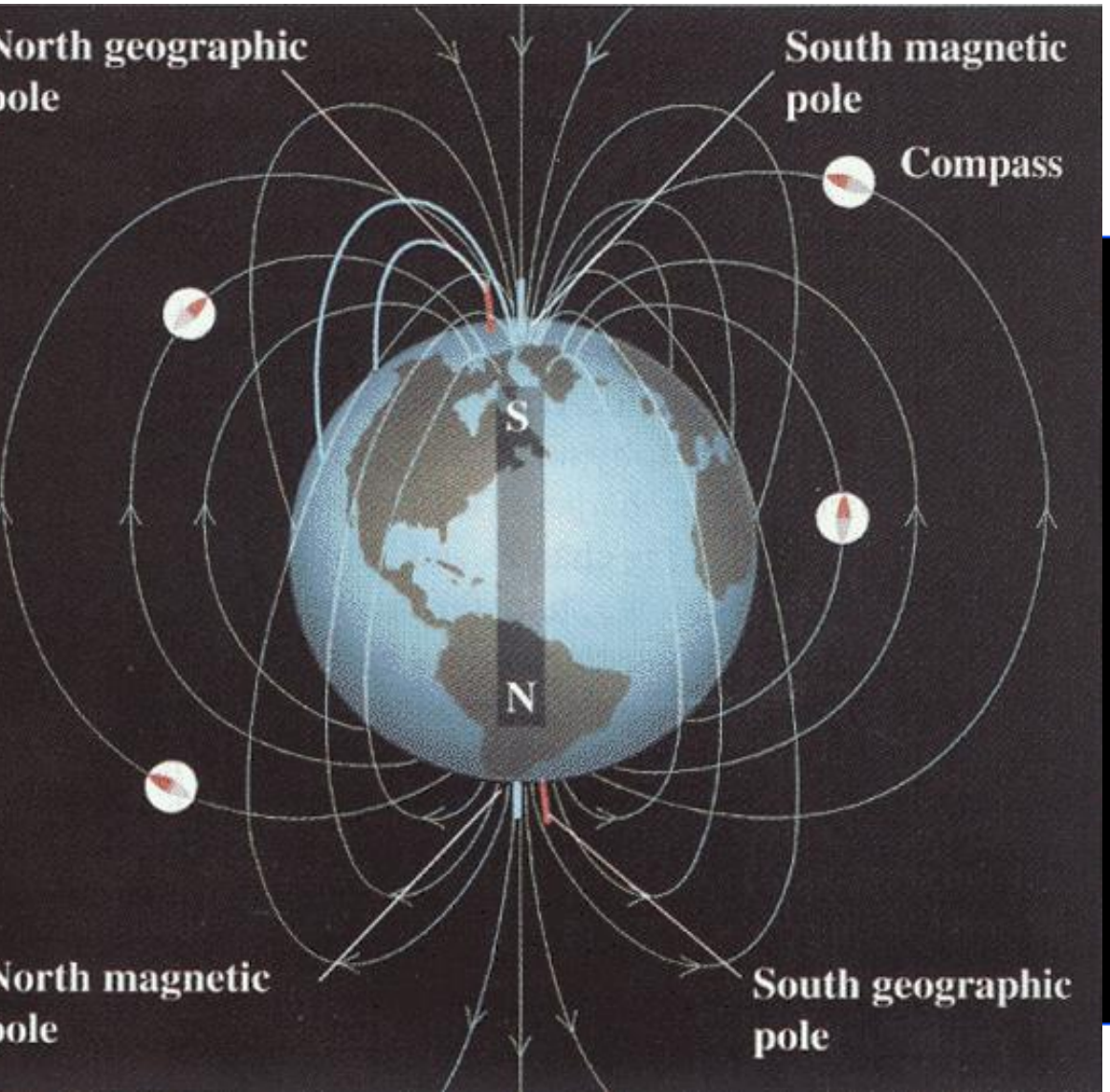
flux lines per unit area

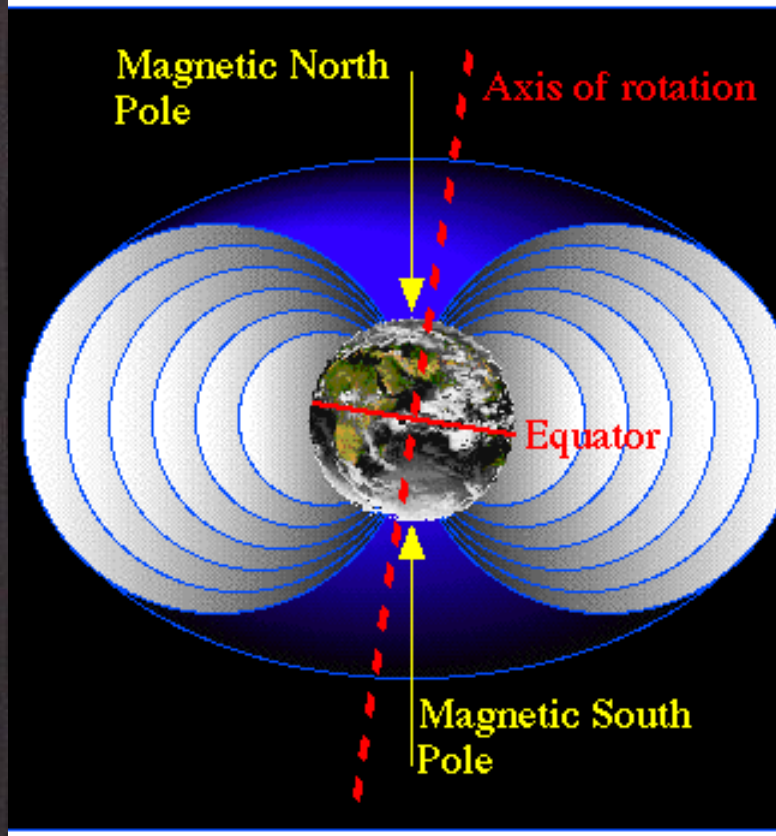


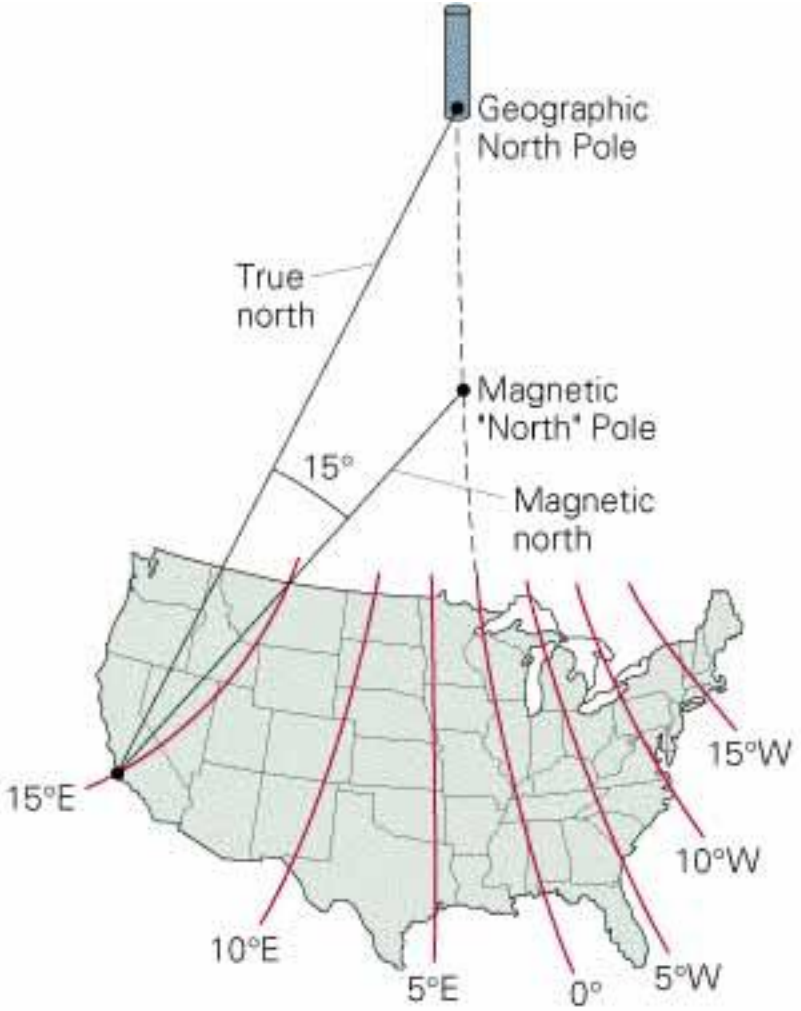
Strong magnet



Weak magnet


North geographic pole
South magnetic pole
Compass
S
N
North magnetic pole
South geographic pole

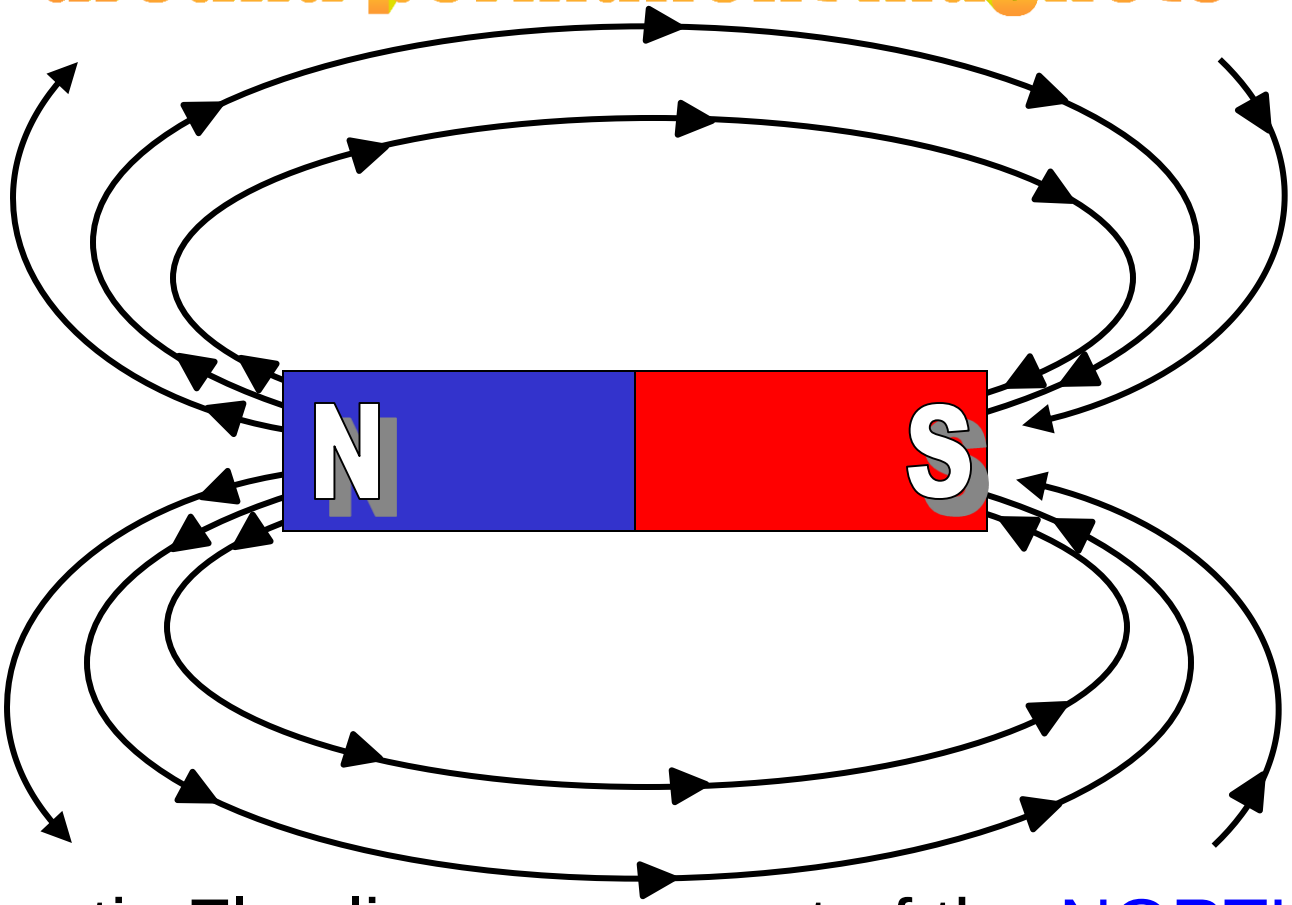

Magnetic North Pole
Axis of rotation
Equator
Magnetic South Pole


Geographic
North Pole
True
north
Magnetic
"North" Pole
15°
Magnetic
north
15°E
10°E
5°E
0°
5°W
10°W
15°W

(b)

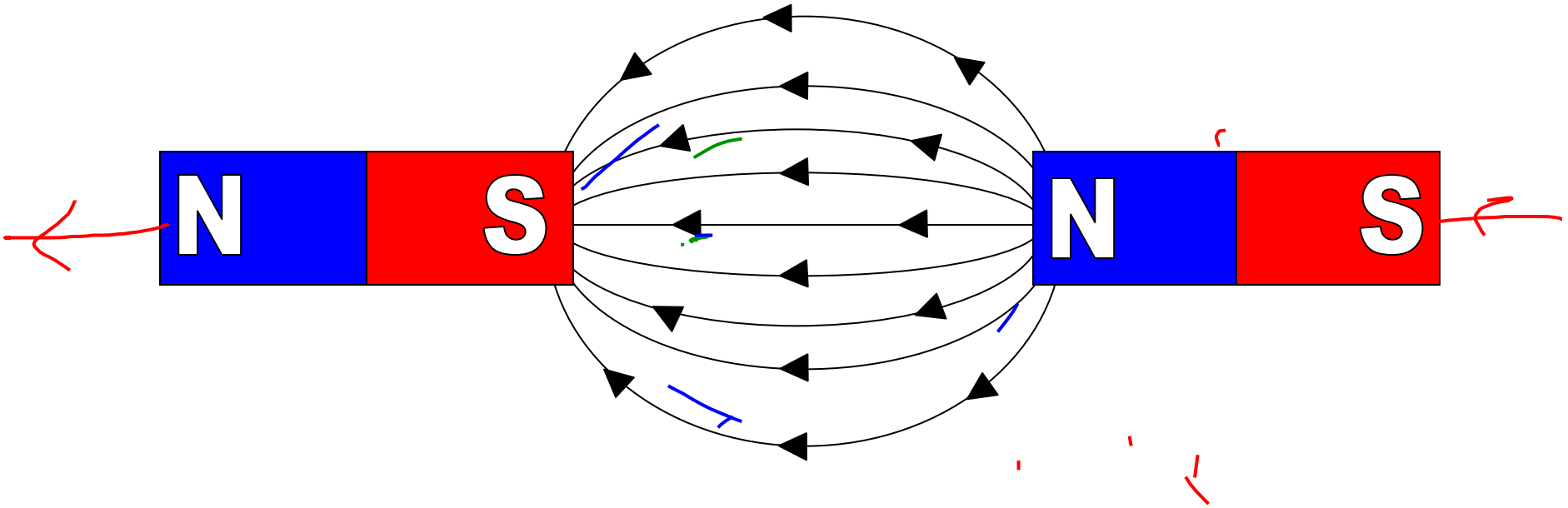
Magnetic Fields

around permanent magnets



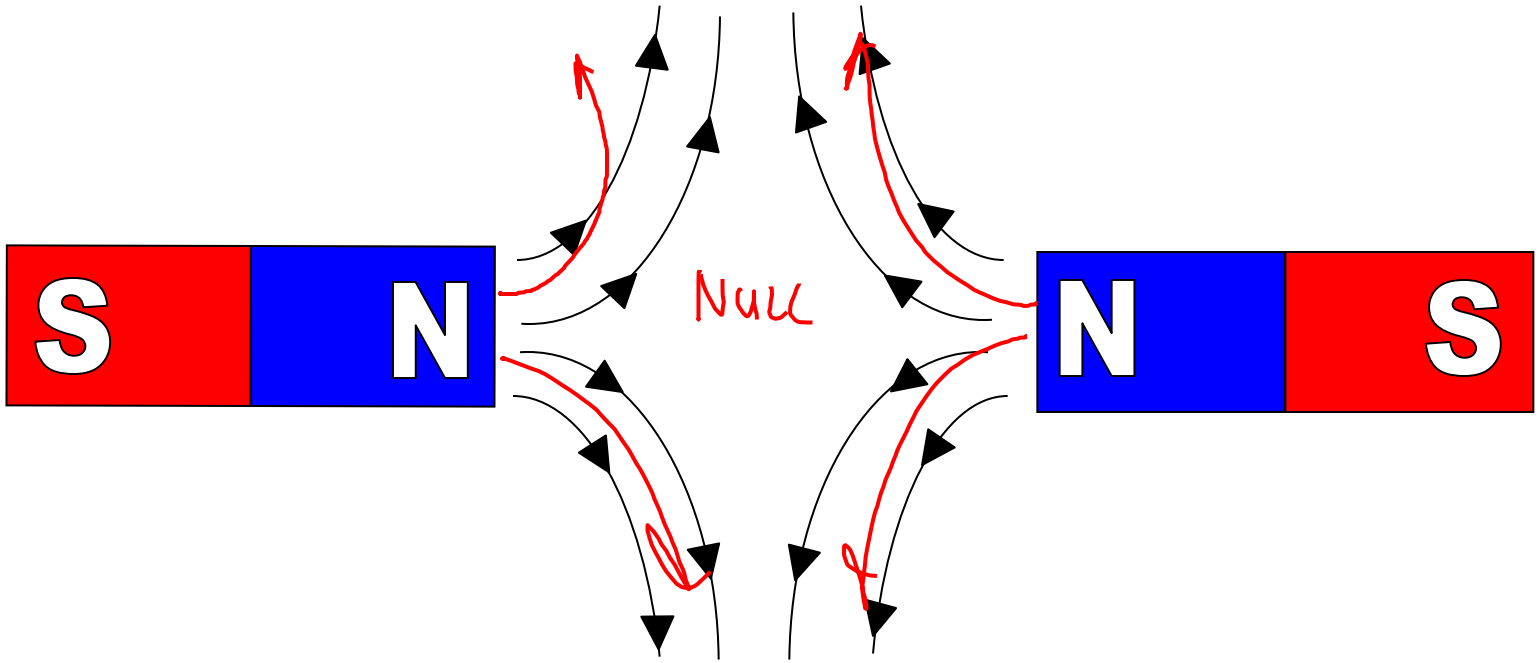
Magnetic Flux lines come out of the NORTH pole and go into the SOUTH pole.

Magnetic Fields
around permanent magnets



Magnetic Flux lines come out of the NORTH pole and go into the SOUTH pole.

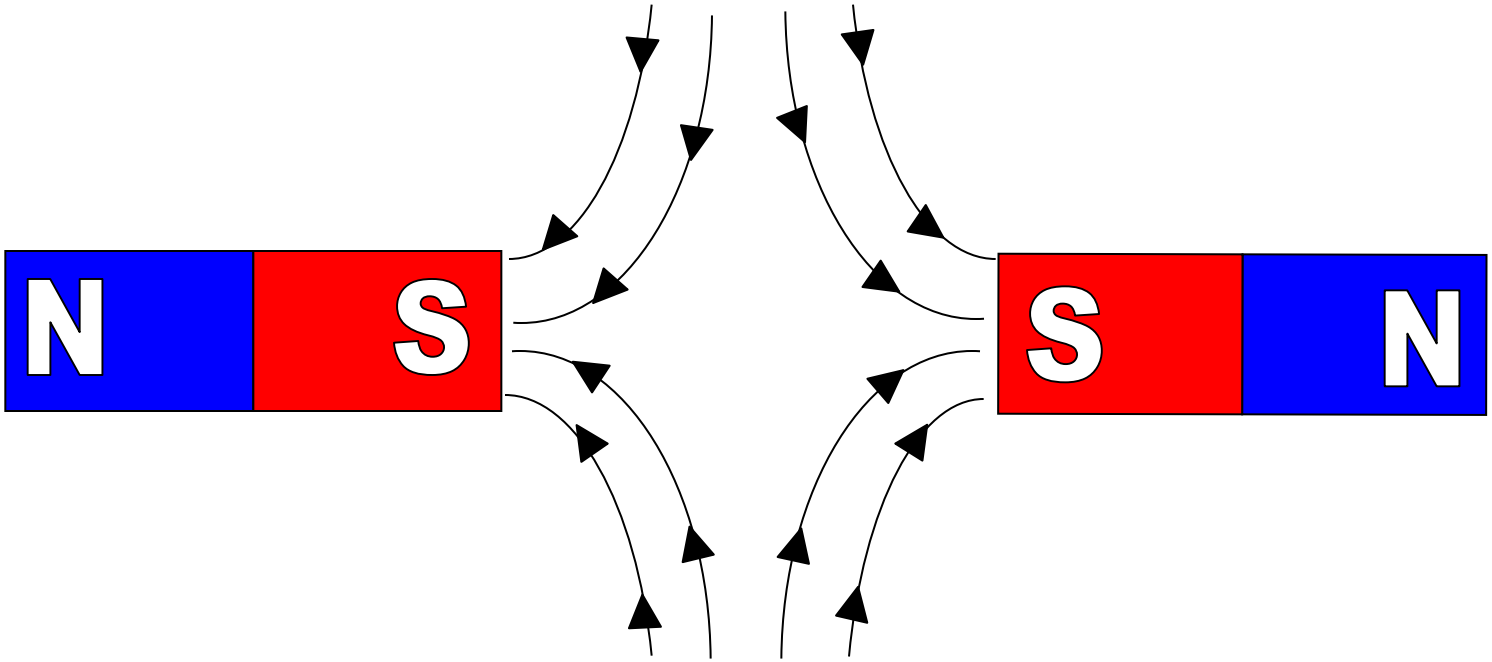
Magnetic Fields
around permanent magnets



Magnetic Flux lines come out of the NORTH pole and go into the SOUTH pole.

Magnetic Fields

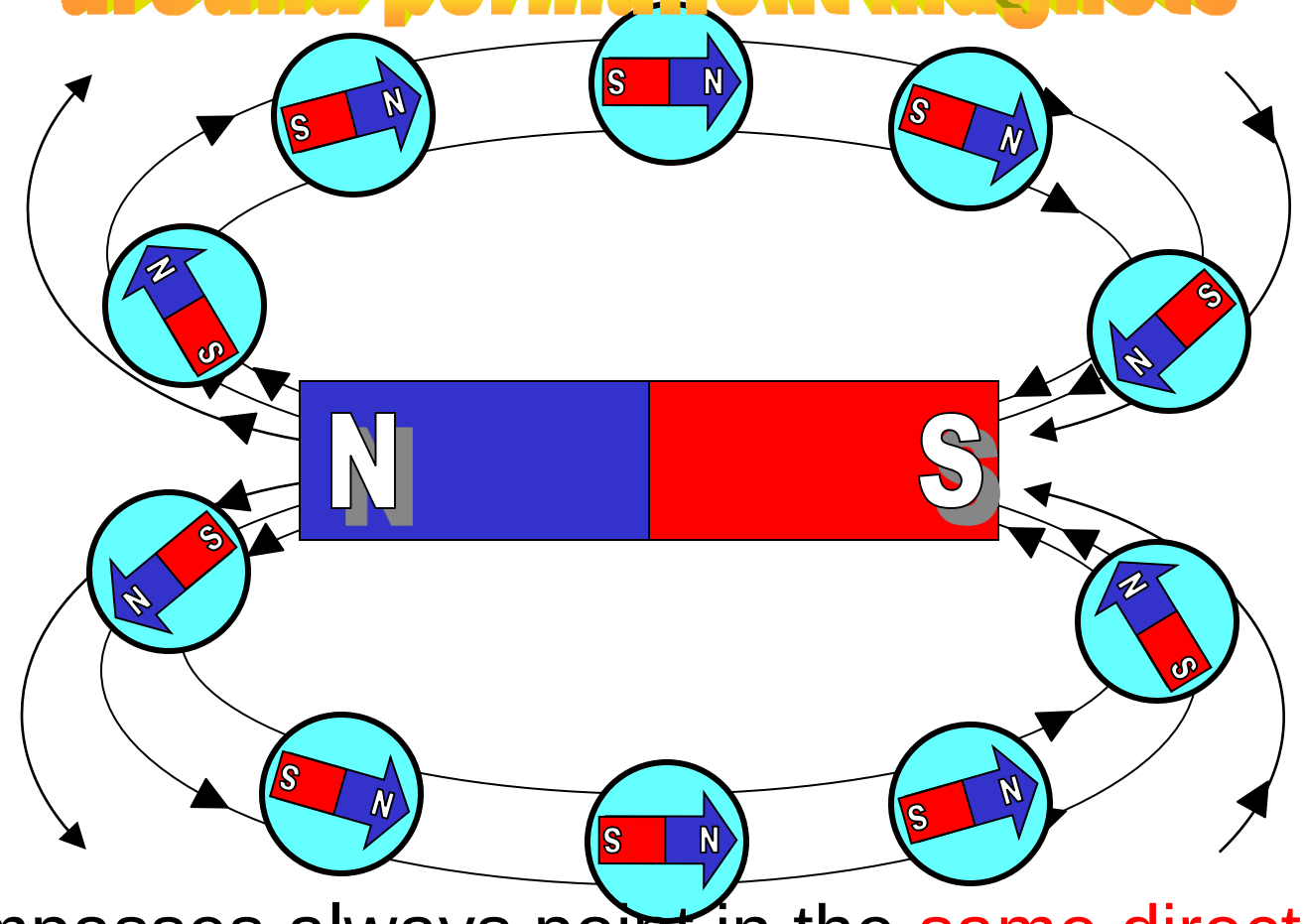
around permanent magnets



Magnetic Flux lines come out of the NORTH pole and go into the SOUTH pole.

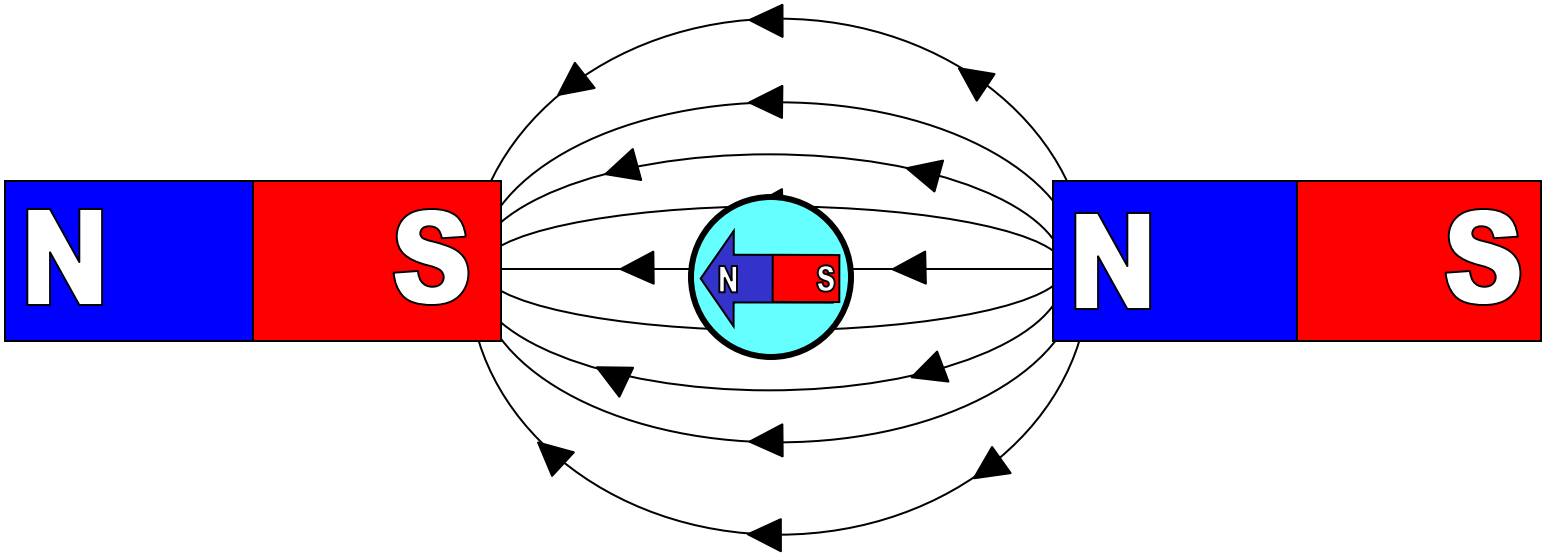
Magnetic Fields

around permanent magnets



Compasses always point in the same direction as the magnetic flux lines at that point.

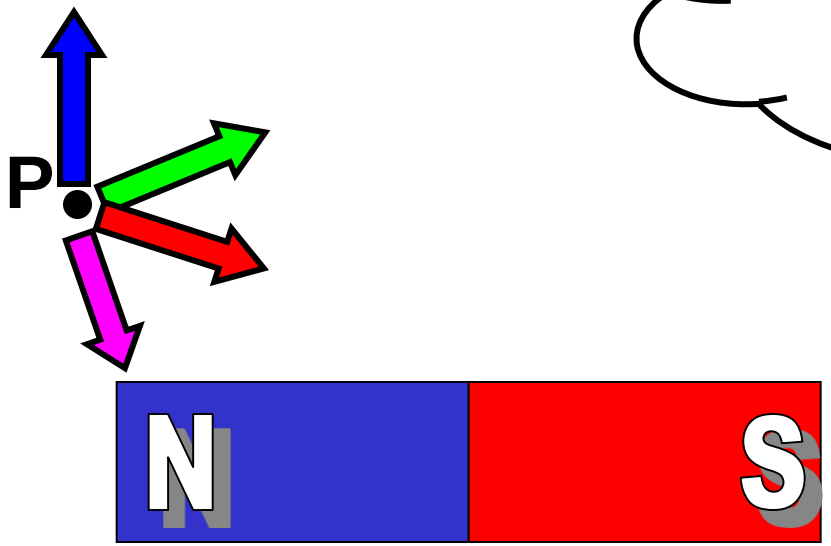
Magnetic Fields

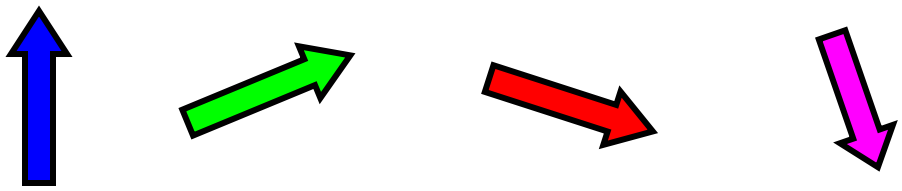


Compasses always point in the same direction as the magnetic flux lines at that point.

QUESTION

Which direction would a compass point if placed at point P?



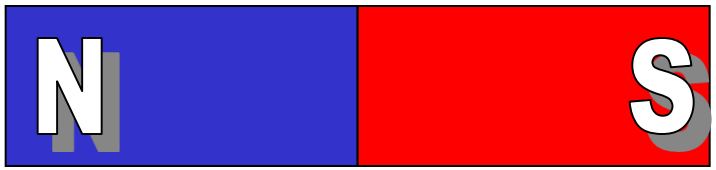


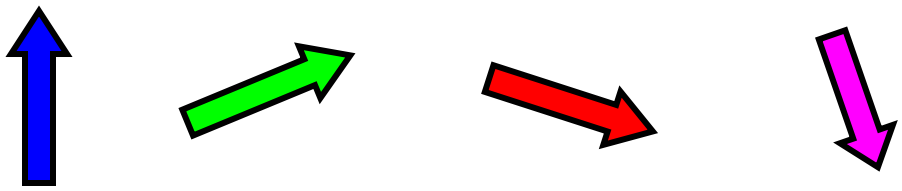
Click on your best answer

QUESTION

Which direction would a compass point if placed at point P?

P



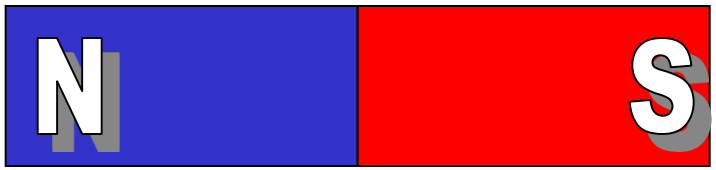


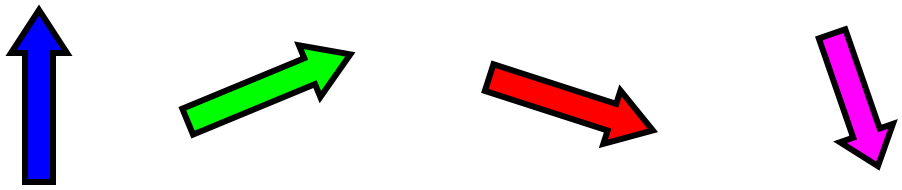
Click on your best answer

QUESTION

Which direction would a compass point if placed at point P?

P

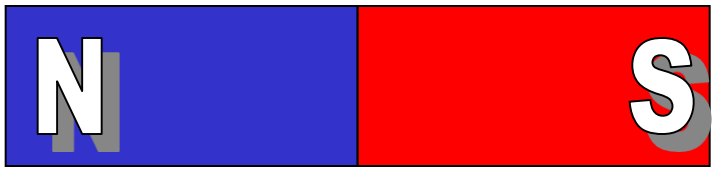


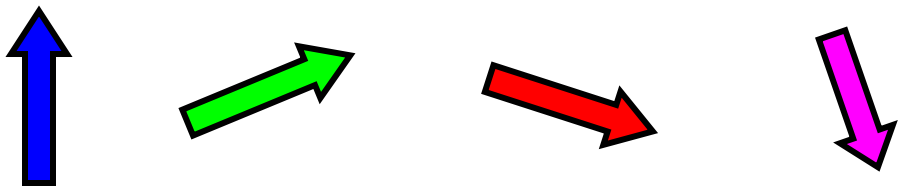


Click on an answer or click on Doc to skip question

Fantastic!

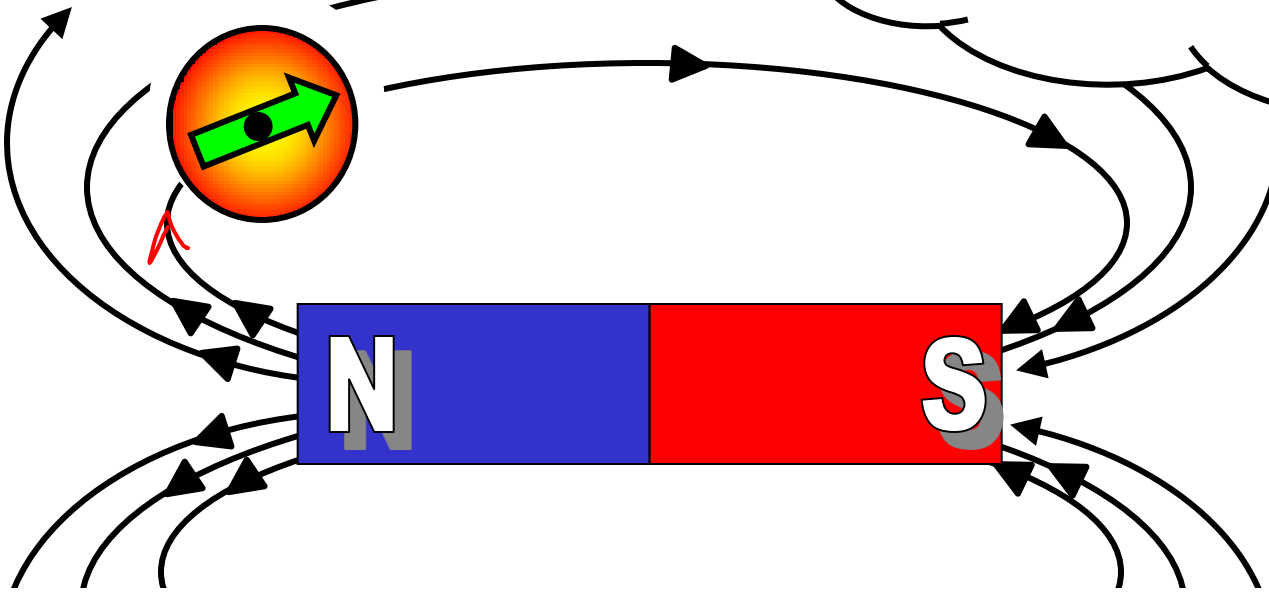
P

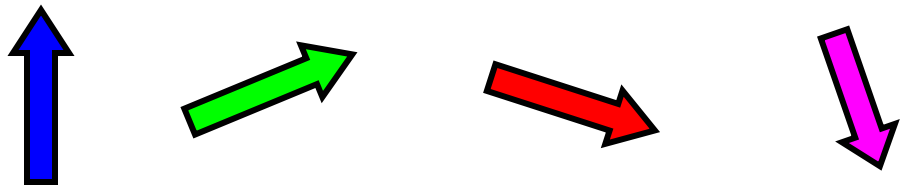




Click on your best answer

A compass points in the same direction as the magnetic field at that point.





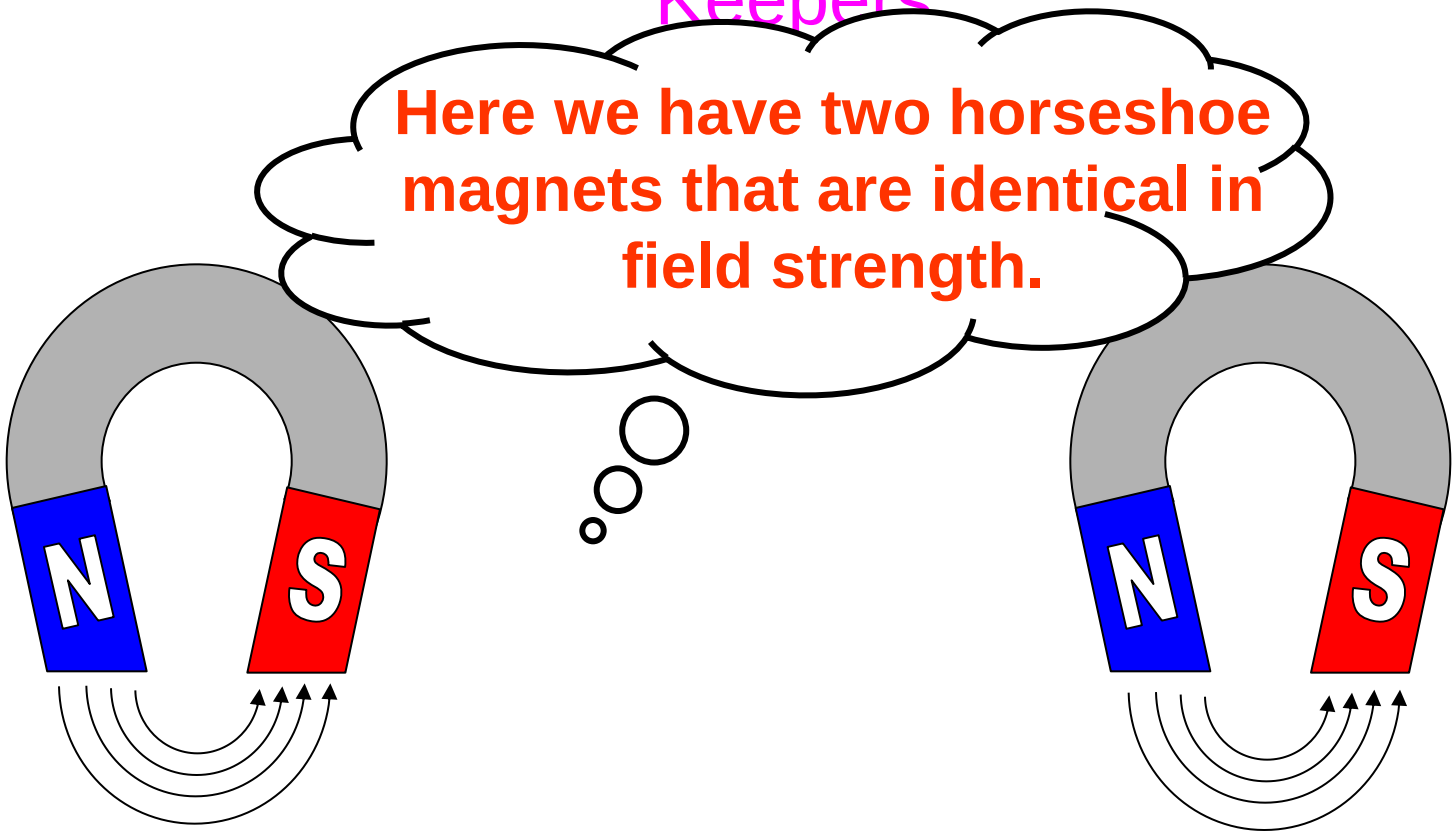
Click on your best answer

Magnetic Fields

Ferromagnetic materials concentrate the magnetic lines of force.

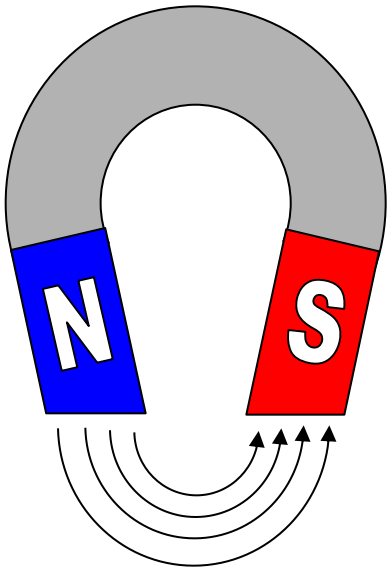
Magnetic Fields

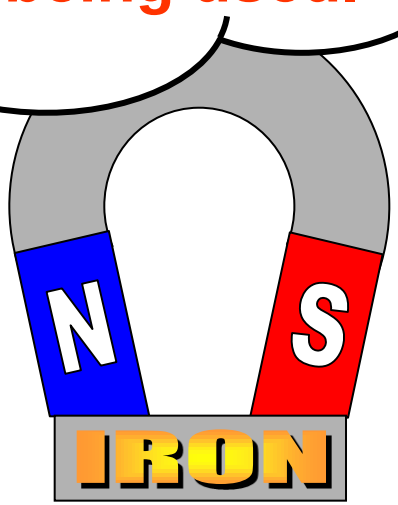
Keepers



Magnetic Fields

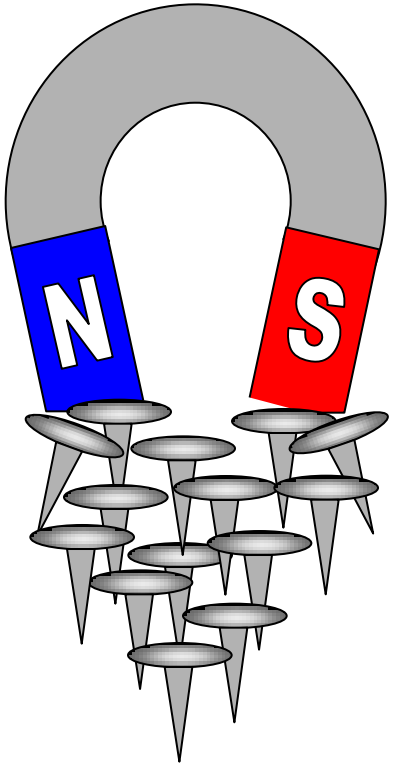
Attached to this magnet is a "keeper" that helps the magnet maintain its strength when not being used.

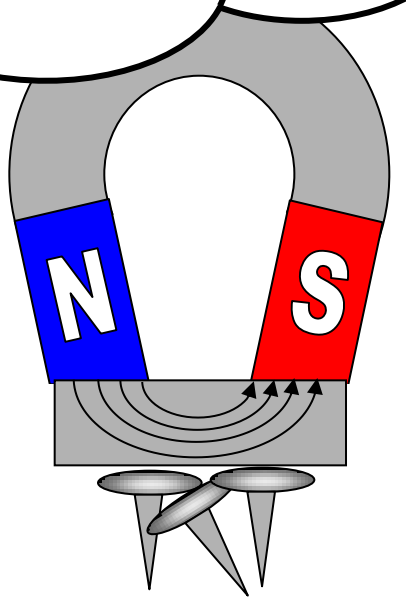




Magnetic Fields

Storing magnets with keepers helps maintain their strength for longer periods of time.





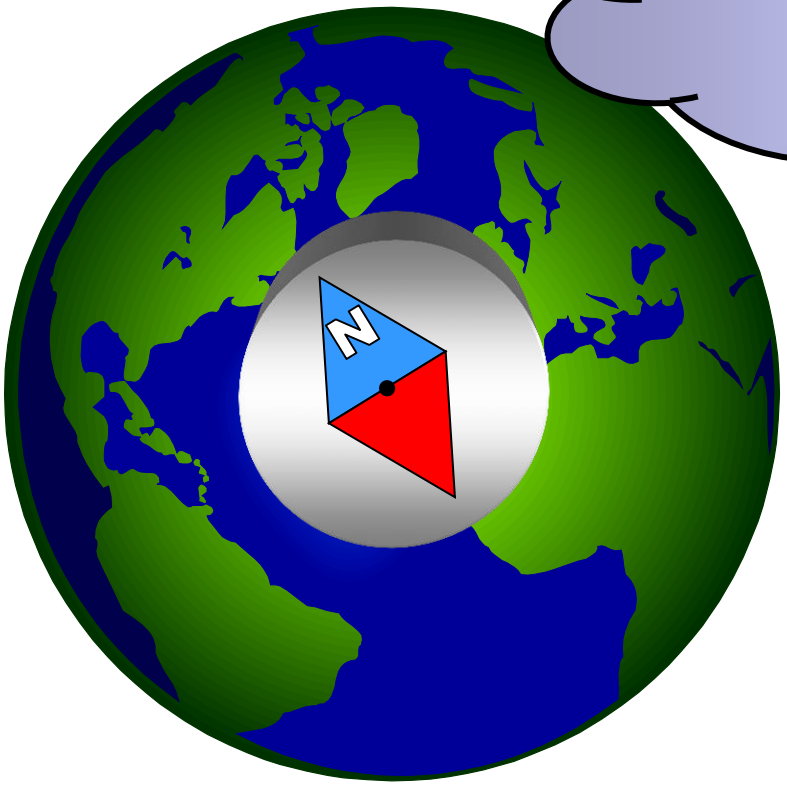
Magnetic Fields

Ferromagnetic materials concentrate the magnetic lines of force.

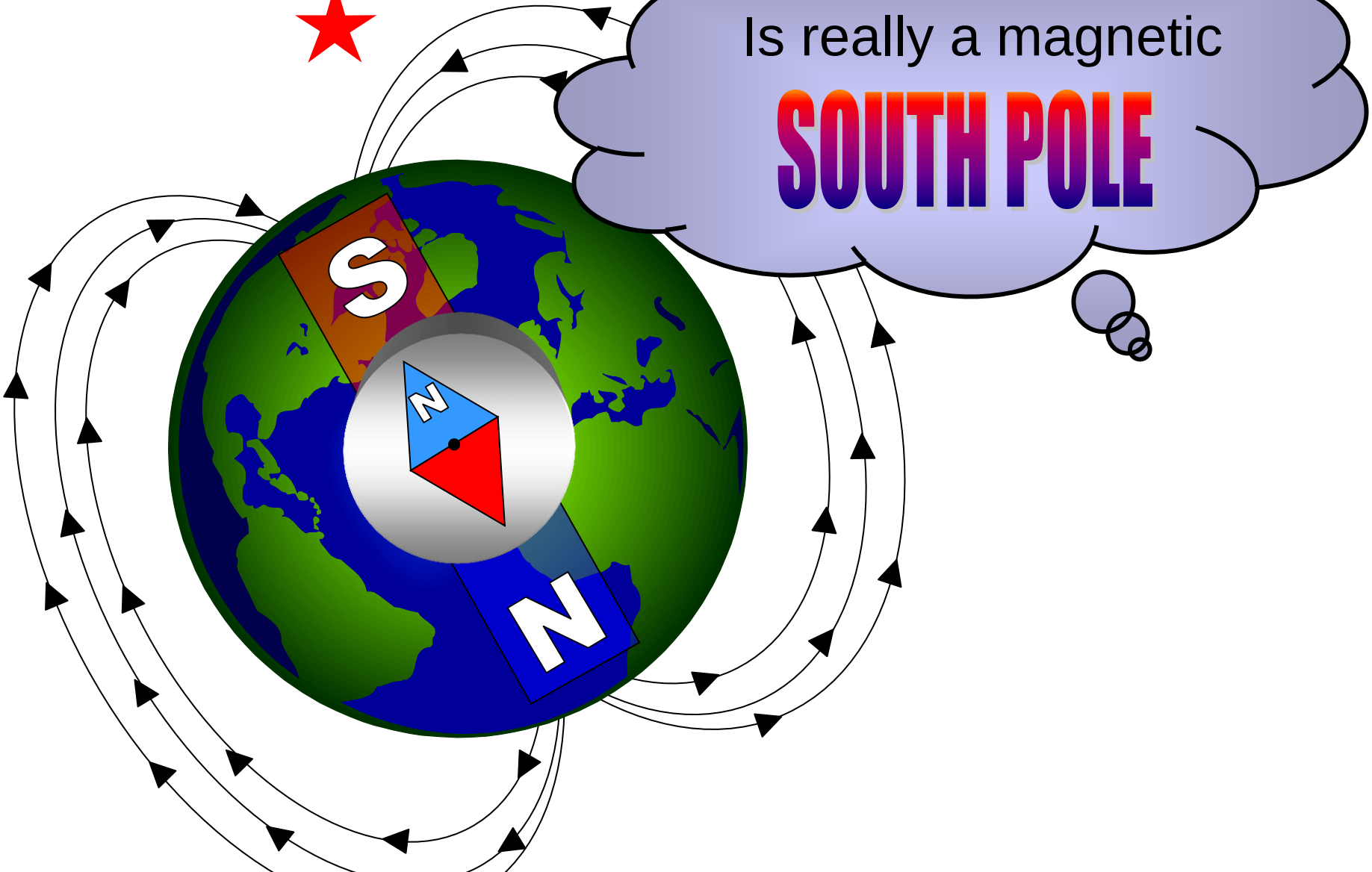
Magnetic Fields

Notice that the geographic

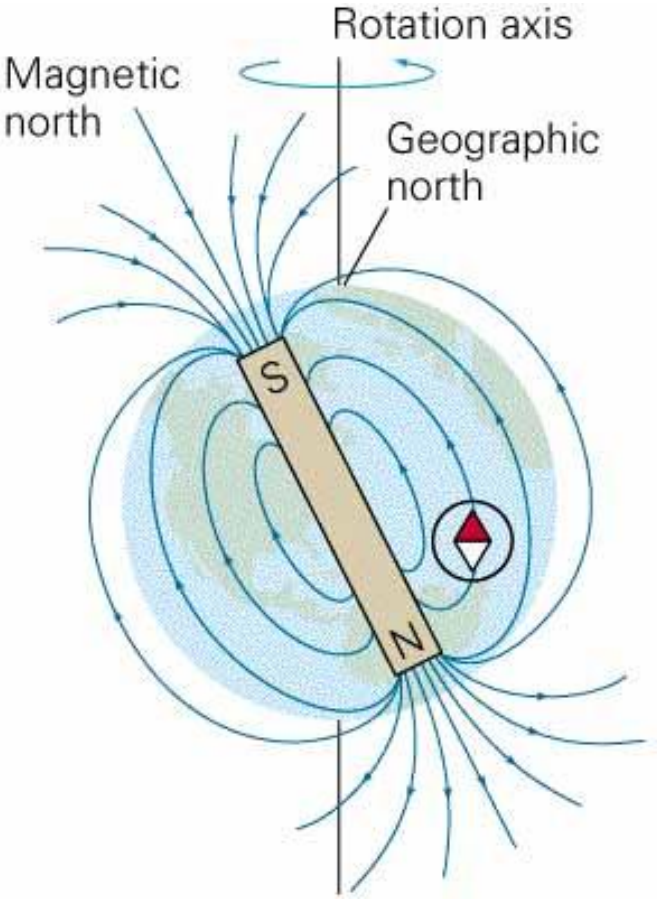
NORTH POLE



Magnetic Fields



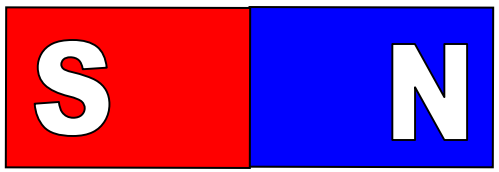
This picture of a bar magnet cant be true because the center of the earth is hot liquid lava. Magnets are destroyed by



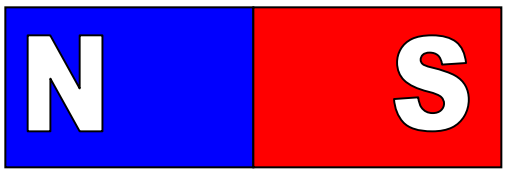
Magnetic Fields
around permanent magnets

QUESTION

What is the direction of the magnetic field at point P?



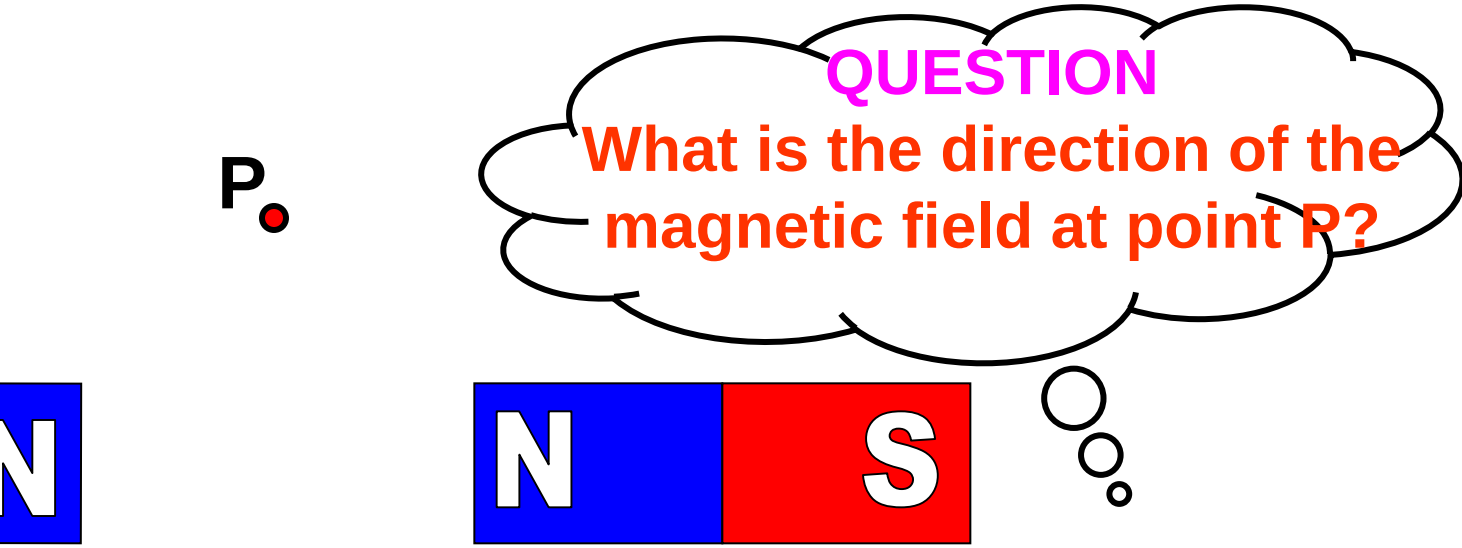
P



UP DOWN RIGHT LEFT

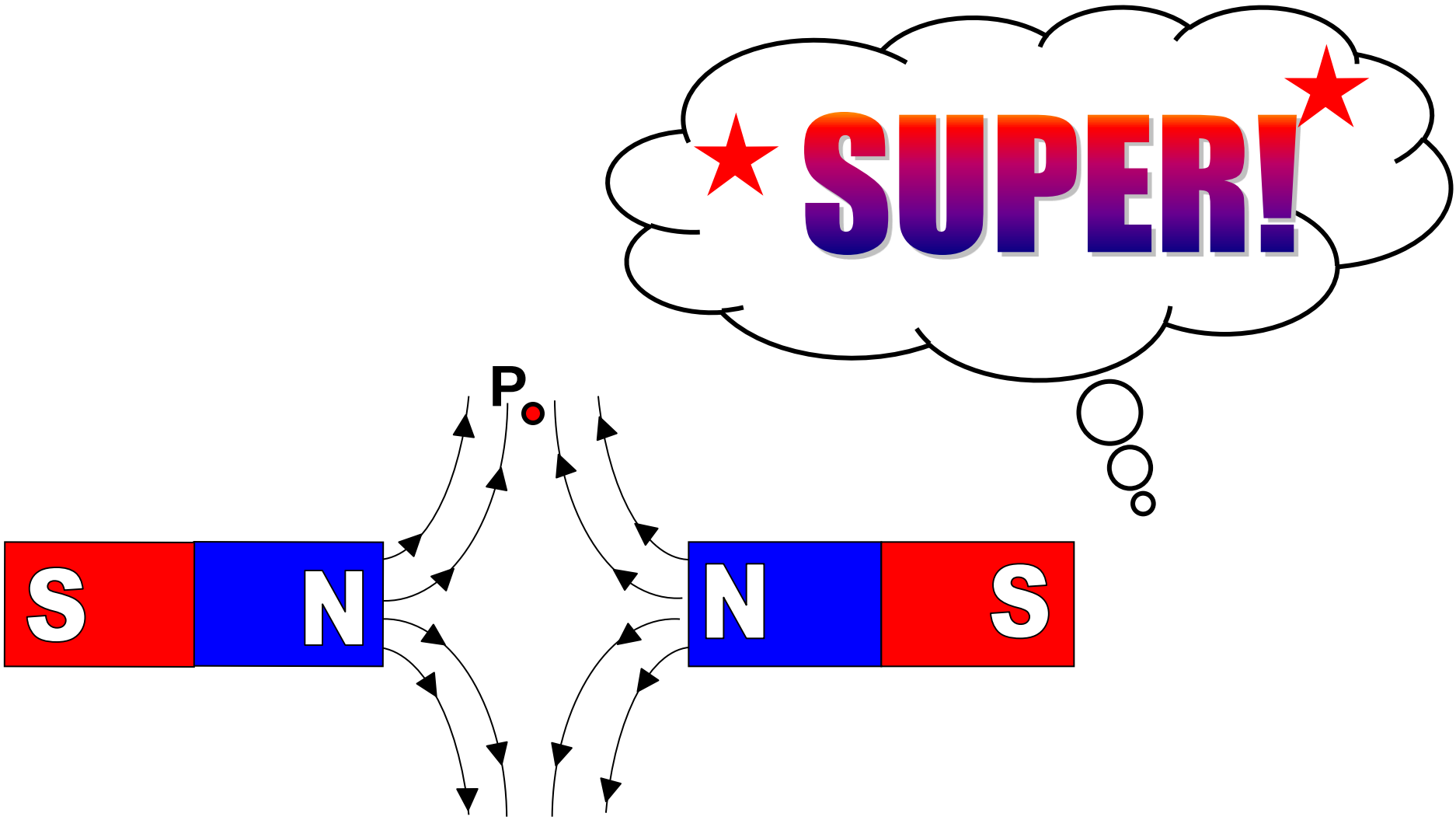
Click on your best answer

Magnetic Fields
around permanent magnets



UP DOWN RIGHT LEFT

Click on your best answer


SUPER!
P
S
N
N
S